Perspectives of commercial use of straw- and wood-fired boilers in Ukraine

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In Ukraine the consumption of energy today is based on traditional sources (fossil fuel). Total demand of energy sources in 1997 year according to statistic data [1] was 138.3 mtoe, including 67.2% as fuel for industrial boilers and furnaces and 12% for heat energy production. In 1997 year Natural gas and Coal cover 44.4% and 21.9% of Primary Energy Demand (PED) in Ukraine correspondingly. Ukraine is heavily dependent on import of energy resources as most of them are imported, besides prices for these resources are quite high for Ukraine. Total supply of own energy carriers is only 42%, including by coal – 80%, by gas – 20%, by oil – 13%. Natural gas price is 60-80 USD/1000 Nm^3, and heat price is about 0.011 – 0.013 USD/kWh now. While local biomass energy resources cover only 0.4% of the energy consumption and price of biomass is very low.

Ukraine is known mostly as agricultural country. The share of agricultural land is about 69.3% from total area of Ukraine, while forest area consists of 15.5% only. Due to good climate conditions and black soil availability, biomass potential of Ukraine as renewable energy source is very high. On the base of statistic data [1] the annual balance of biomass residues (straw and wood) in 1997 year is presented in the Table 1. The share of biomass residues not used by other sectors of economy and available for energy production was estimated on the base of expert evaluations.

Table 1: The annual balance of biomass residues in Ukraine in 1997 year

Type of biomass residues	Total amount of biomass residues, mill t	LHV, MJ/kg	Share of biomass available for energy production		Potential of biomass for energy production,
			%	mill t	mtoe
Cereals grain/ straw	24.25	15.7	20	4.85	1.82
Wood residues	4.1	9.0	71	2.91	0.62
Total	108.78			7.76	2.44

It means that about 1.8% PED could be replaced just by using available straw and wood residues. Straw heating has in comparison of heating with other biomass resources the largest potential because the availability of straw is good and the heating efficiency high. Due to transport cost it is assumed that straw has to be used mainly on farms or nearby village district heating system. Heating of this sector today is based on traditional sources (fossil fuel). According to statistic data [1] energy consumption of agricultural sector of Ukraine was 2.52 mtoe in1997 year (including 0.6 mill tons of coal and 800 mill m^3 of gas). The straw surplus for heating in Ukraine is estimated to be 4.85 mill tons of straw, equal to approximately 13000 small-scale straw fired farm units (of 0.1 – 1.0 MW_{th} capacity).

The Wood residues structure in 1997 year depending on source of generation is presented in the Table 2. Availability of wood residues from different sources of generation is different as well. The most available are residues from wood processing enterprises. Besides usually these enterprises are big consumer of technological/processing heat. At present this heat often is produced from traditional sources (fossil fuel). Since many wood processing enterprises have unutilised wood residues, and cost for heat generation with natural gas are high, it is expected the great commercial potential for wood fired boilers in Ukrainian wood processing industry. The wood residue surplus for heating in Ukraine is estimated to be 2.91 mill tons of wood, equal to approximately 240 DH stations (of 1 – 10 MW_{th} capacity), 113 industrial wood fired boiler (of 0.1 – 5 MW_{th} capacity) and 20000 domestic boilers (of 10 – 50 kW_{th} capacity).

Table 2: Wood residues structure in 1997 year depending on source of generation.

Source of generation	Amount, mill m^3	Average moisture	Energy

	solid volume	content, %	potential, mtoe
Not transported felling residues (which are burnt in the forest now)	2.412	50–60%	0.269-0.288
Wood processing residues after primary processing.	0.636	40-45%	0.106
Wood processing residues after production of finished products	0.519	25-30%	0.087
Transported firewood	1.3	45-50%	0.145-0.166
TOTAL	4.867		0.607-0.647

The technologies of biomass utilization are only in the beginning of their development in Ukraine, but they have good commercial perspectives in the nearest future. At present several demonstration projects in the field of bioenergy are being fulfilled in Ukraine. These plants will be the first modern large-scale bioenergy plants in Ukraine.

Firstly it is Dutch-Ukrainian technical assistance project PSO98/UK/4/2 "Energy saving and CO_2 reduction in the timber industry of Ukraine". This project is supported by Executing agency SENTER of Dutch Ministry of Economic Affairs. Steam boiler of 5 MW_{th} was installed at the veneer plant "Odek-Ukraine" in Orzhiv, and steam boiler of 1.5 MW_{th} was installed at the timber enterprise in Malin. The boilers are equipped with step moving grates and designed for combustion of wood chips, bark and sawdust up to 60% of moisture content.

The other is the Danish-Ukrainian project "Introduction of small-scale straw-fired heat production in Kiev oblast, Ukraine" that supported by Danish Energy Agency. In frame of the project whole bale straw-fired boiler of 900 kW was installed at village Drozdy, Kiev oblast.

On the base of these projects feasibility studies of perspectives implementation straw- and wood fired boilers in Ukraine were made. International consultants identified also a number of major key obstacle for fastest and successful spreading of biomass combustion technologies in Ukraine. There are:

- an almost complete vacuum of information in Ukraine on biomass for energy production;
- not enough demonstration units in Ukraine to promote biomass heating;
- no local production of straw- or wood fired boilers in Ukraine at the moment;
- lack of financial support for bio-energy that especially need in the period of its development;
- with the existing financial system it is hard to find funds for the investment these technologies;
- an almost complete lack of legislation in Ukraine for the foundation of straw- or wood heating;
- there is a need for institutional development in the field of biomass heating in Ukraine;
- it is a lack of heat saving measures and strong heat saving regulation in Ukraine.

In frame of above mentioned projects some of the obstacles, like information vacuum and a lack of demonstration activities have been partially overcome already. At the moment in Ukraine is starting process of establishment Ukrainian production of biomass fired boilers. The USA manufacturers are welcome on a new and very perspective market.

Conclusion

We estimate large potential of good available biomass for energy production in Ukraine. Relatively low prices of biomass fuels in comparison with traditional fuels lead to short pay back periods of biomass boiler implementation (about 3 years). Heat production from biomass is competitive and has a good chance for commercialisation especially in case of co-operation or joint venture establishing. The most promising development strategy of biomass utilisation technologies in Ukraine, at least in the first stages, seems to be manufacture of corresponding license European equipment at the industrial plants of Ukraine.

References

[1] Statistical year-book of Ukraine. 1997. – Kiev: Technika, 1999. – 519 p.